MN LiDAR Data Download by Polygon ~An ArcGIS 10.1 Toolbox Tool

General Description

- This Toolbox contains a tool that downloads LiDAR data associated with a polygon of interest from within ArcMap.
- Requires Esri® ArcGIS™ 10.1 with Service Pack 1.0
- Operates on a *Singlepart-polygon* shapefile or FeatureClass.

Acquire the Tool

1. Toolbox Download Options:
    a. Click here to obtain the ArcGIS toolbox zip file:
    ftp://ftp.lmic.state.mn.us/pub/data/elevation/lidar/tools/toolboxes/Lidar_download_ArcGIS_toolbox/ArcToolBox_mn_lidar_download_tools.zip
    b. Map to the Toolbox URL:
    ftp://ftp.lmic.state.mn.us/pub/data/elevation/lidar/tools/toolboxes/Lidar_download_ArcGIS_toolbox/
    Download: ***arctoolbox_mn_lidar_download_tools.zip***

2. Unzip the packaged toolbox file to your hard drive.
    - Location of the toolbox package is a non-specific user defined location.
        i. Remember where you have placed the toolbox; you will need to navigate to it during setup.
    - Keep the folders and files of this package together.
    - In the folder "***arctoolbox_mn_lidar_download_tools***" you will find:
        i. An 10.1 toolbox named "***MN LiDAR Download.tbx***"

Background

- This Toolbox contains a tool that downloads LiDAR data associated with a single polygon of interest from within ArcMap.
    - **Polygon Footprint** of the download area is defined by a singlepart-polygon FeatureClass/shapefile **or** the selected polygon of a FeatureClass/shapefile defined by the user within ArcMap.

- **FeatureClass** must have a projection defined – if not, UTM Zone 15 will be assumed.
- **Multipart** polygon datasets must be separated into individual polygons (see "*Multipart To Singlepart*" topic in ArcGIS Help).

- Tool Features.
  - Automatically goes to Minnesota's MnGeo LiDAR data download FTP URL.
  - Downloads the zipped File Geodatabase(s).
    - The tool unzips each file geodatabase and removes the zipped version.
  - User can choose to Merge Tiles.
    - The downloaded tiles will be merged together into a file geodatabase.
    - This is a big savings to the user; as they no longer need to mosaic the tiles covering their area of interest themselves as a separate processing step.
  - Downloads the compressed LAS file(s) (.laz)
    - Downloads LASZIP.EXE from source
    - Uncompresses LAZ files to LAS files
    - A LAS dataset will be created.

SOFTWARE REQUIREMENTS

- **Esri® ArcGIS™ 10.1 with Service Pack 1.0**
  1. Check your version of ArcMap
     a) Left Click on the ***Help*** dropdown Menu, click on "***About ArcMap…***"

Figure 1

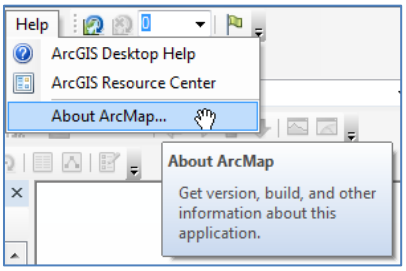


Figure 2

BUGS & FIXES

- Like all custom tools, this one has gone through many development iterations and much testing before publication. However, bugs are likely to show up.
  - September 30, 2013 – Anecdotal evidence suggests that Multipart polygon datasets will not work with the tool (see "*Multipart To Singlepart*" topic in ArcGIS Help).
  - August 26, 2013 – Recent reported errors and subsequent troubleshooting indicates that users will need ArcMap v10.1 and Service Pack 1.0 due to some recent JSON scripting added to the tool.

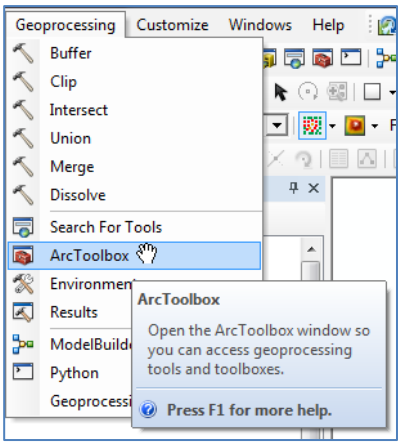
SETUP

1. Add the tool to the ArcTOOLBOX.
   a. Open the ArcToolbox window via 2 suggested methods:
      i. Click on the ArcToolbox icon on the Standard Toolbar **OR**

OR

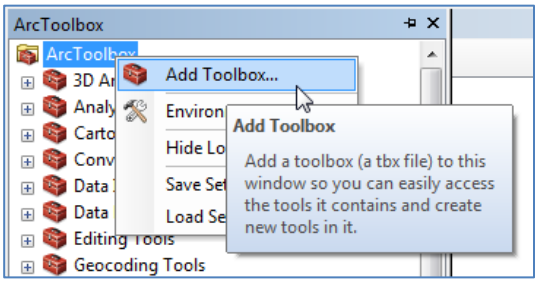
      ii. Choose ArcToolbox from the Geoprocessing menu.

Figure 3



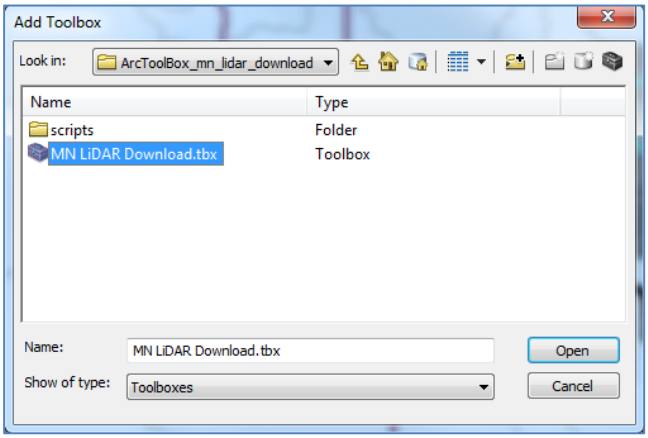
b. Add the tool by right-clicking in the ArcToolbox window, choosing "***Add Toolbox…***" (see Figure 4).

Figure 4



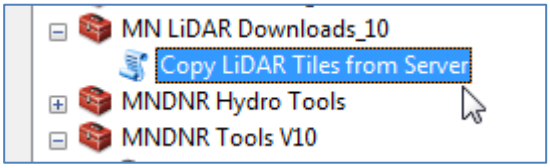
c. Navigate to the location on your hard drive where you saved the download file "***arctoolbox_mn_lidar_download_tools***". Select and add/open the toolbox name "***MN LiDAR Download.tbx***" (see Figure 5).

Figure 5



2. Within the ArcMap ArcToolbox window, locate and expand the toolbox called ***MN LiDAR Downloads_10***.

Figure 6 - Toolbox Configuration

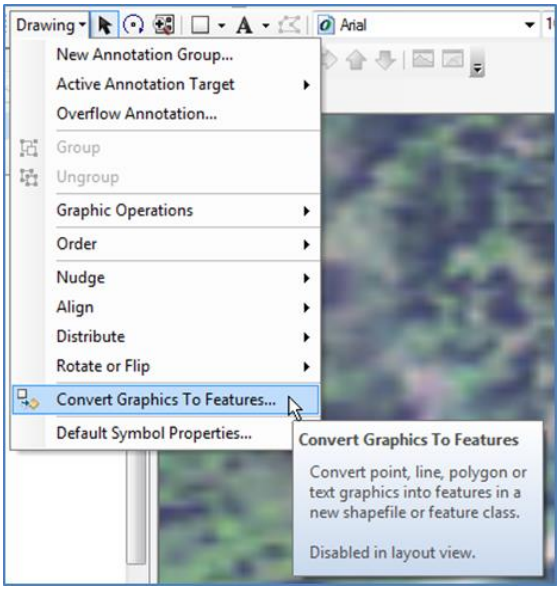


3. Doubleclick on the script "***Copy LiDAR Tiles from Server***" to open the dialog window shown in Figure 8.

RUNNING THE TOOL & INTERFACE DESCRIPTION – 5 USER DEFINED INPUTS & OUTPUTS

1. Identify or create the polygon for your location of interest.
   a. Load a polygon feature class into the Table of Contents.
   b. Select polygon feature(s) of the area of interest if needed.
      - **Hint 1.1: Graphic to Polygon**.
        - If you do not have an existing polygon associated with your area of interest, a fast way to obtain LiDAR data for the area while zoomed in is to create a graphic on the map using the *Draw Toolbar* (see "*Adding a New Graphic*" topic in ArcGIS Help). Then convert the graphic to a Feature (see "*Converting graphics into features*" help topic).

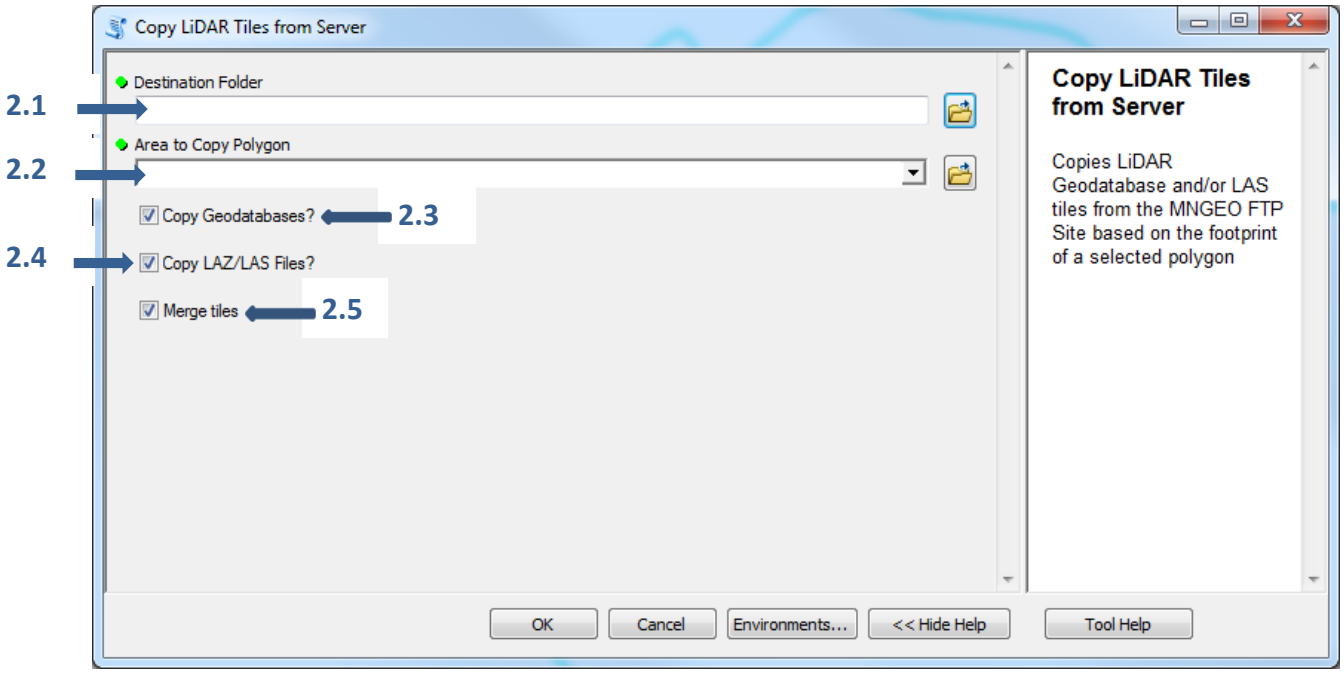
Figure 7



- **Hint 1.2: Load the Polygon Feature First**.
  - The polygon shapefile/FeatureClass used as the *Area to Copy Polygon* (with or without selected feature(s)) must be loaded into the Table of Contents prior to initializing the tool. If it is not in the Table of Contents, the layer will not show up as an option in the dropdown menu (see Figure-8, item 2.2).
  - If you use the dropdown menu in the tool and you do not see your intended feature class, simply close the tool, add the feature class, then re-open the tool.

2. Fill out the ***Copy LiDAR Tiles from Server Tool*** window.

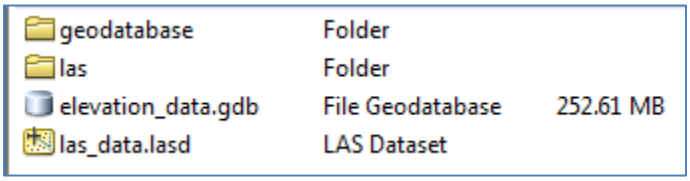
Figure 8 - Tool Dialog



2.1 Destination Folder

- This is the output folder where the data will be saved.
  - Output/Results:
    1. GEODATABASE folder that stores the File Geodatabase tiles if selected in tool item 3.
    2. ELEVATION_DATA.GDB if you choose to merge the data.
    3. LAS data that stores the LAS files if this option is selected in the Tool (see Figure 8, item 2.4.

Figure 9 – Data Structure Example



2.2 Polygon Area to Copy

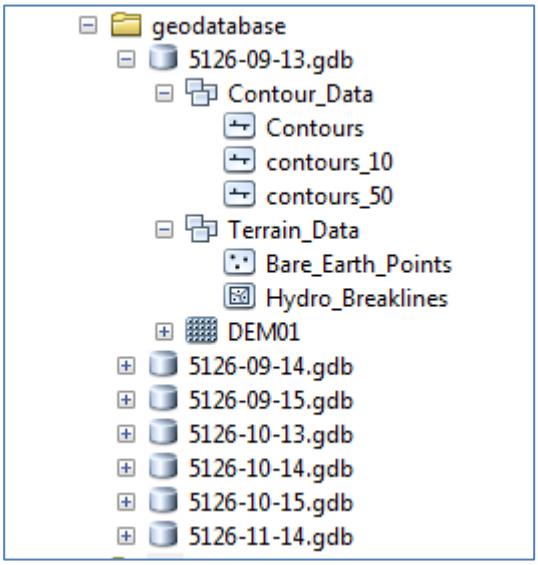
- This is a polygon dataset with one or more polygons representing your area of interest.
  - Use the dropdown menu to select the shapefile/FeatureClass polygon from the ArcMap Table of Contents.

- If you have more than one polygon in the dataset, it works on the selected polygon.
- If you have only one polygon in the FeatureClass of interest, it does not have to be selected.
    - **Hint 2.2:** Double-check your polygon dataset to ensure you do not have more than one selected feature. Multiple selected polygons can result in an unnecessarily large download operation.

2.3 Copy Geodatabase Option

- Check this box if you want to copy the File Geodatabase Tiles.
    - Output/Results:
        a. A geodatabase folder will be created in the destination folder.
        b. This folder will contain a geodatabase folder for each tile.
        c. Each tile geodatabase will contain:
            - ✓ **contours** (2-foot)
            - ✓ **Bare_Earth_Points**
            - ✓ **Hydro_breaklines** (used to flatten lakes to a constant elevation.
            - ✓ **buildings** (building footprints if available for the area of interest).
            - ✓ **dem01** (1-meter DEM)

Figure 10 - Geodatabase Folder Configuration

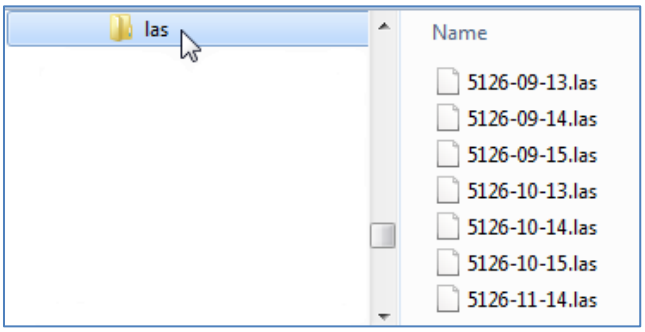


2.4 Copy LAZ/LAS Files Option

- Check this box if you want to copy the LAS files.

- Output/Results: The tool will download the compressed LAZ file and uncompress the files on the fly in the destination folder creating a LAS file for each tile.

Figure 11 - LAS File Configuration



2.5 Merge Tiles Option

- Choose this option if you want to merge the file geodatabase tiles.
- The data will be merged into a File Geodatabase named ***Elevation_Data.GDB***.
  - Merged geodatabase contents:
    - ✓ **contours** (2-foot)
    - ✓ **buildings** (building footprints if available for the area of interest).
    - ✓ **dem01** (1-meter DEM)
    - ✓ **dem01hs** (1-meter Hillshade)
    - ✓ **hydro_breaklines** (used to flatten lakes to a constant elevation.

3. Run Tool. Once you have filled in and selected the five user-inputs, click "**OK**" to start running the tool.

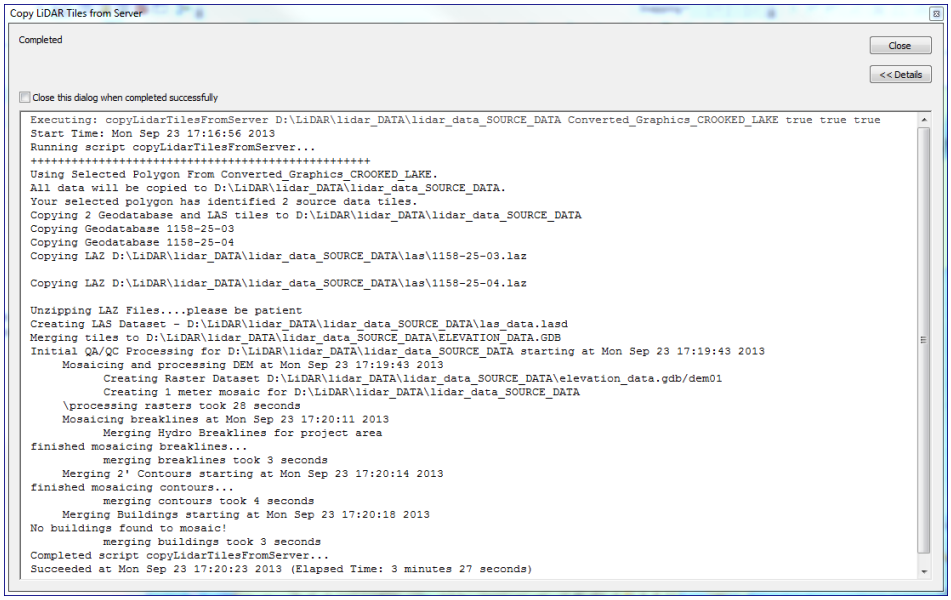
- Be patient. It takes a bit of time to download this voluminous data.
- Monitor the feedback/log window for the tools progress.
- Your Internet access/ISP bandwidth capacity and bandwidth usage relate to download speed and the tools' efficiency.
  - **Hint 3.0:** Use small polygons to select as few tiles as necessary. This will minimize the download time.

TOOL OPERATION FEEDBACK

- The tool will open a window that provides tool information and progress to the user (see Figure 12).
  - Use this window to track the status and success of the operation.

- Capture information from this log window to report bugs and errors.

Figure 12



- Feedback to the user while the tool is executing incudes:
  1) Tool Initiation:
     a. Output location.
     b. Start time.
     c. Script execution.
  2) Identifies user defined:
     a. Polygon dataset.
     b. Output location.
  3) Shows a count of:
     a. How many tiles are needed to cover the footprint of the selected polygon using the tile index that comes with the tool.
     b. Geodatabase files to be downloaded.
     c. LAS files to be downloaded.
  4) Reports when copying begins for each tile of the geodatabase and the LAS files.
  5) Unzips the file geodatabase and removes the zipped version.
  6) Downloads and uncompresses the **LAZ** file.
     a. A LAS dataset will be created.
  7) If you have selected the **Merge Tiles** option the tiles of data will be merged together into a file geodatabase called ***ELEVATION_DATA.GDB*** with:
     a. Output location is reported.
     b. Mosaic of 1-meter DEM (dem01) is developed.

c. 3-meter DEM is generated from dem01.
d. Hillshade of 3-meter DEM is produced.
e. Pyramids for rasters are built.
f. Hydro-breaklines are merged
g. 2-foot contours are merged
h. If present, buildings will also be merged.

8) Tool completion time is reported indicating a successful run.

SUPPORT

- Managed support for this tool is currently not available.
- Help make this tool more robust by posting questions and comments to the following social media sites supporting Minnesota LiDAR Users.
  1. Facebook - LiDAR in Minnesota https://www.facebook.com/minnesotalidar
  2. Minnesota LiDAR Forum - http://www.mngeo.state.mn.us/chouse/elevation/lidar_forum.html
- Capture the information reported in the feedback/log window for reporting your error and further troubleshooting.

CREDITS

- Coding Developed by Tim Loesch, MN.iT Services @ Department of Natural Resources, 07/2013.

- Instructions authored by Sean Vaughn, GIS Hydrologist, MN.iT Services @ Department of Natural Resources.
  - For comments to improve the instructions, contact Sean via email at sean.vaughn@state.mn.us.